REMARKS

Claims 1-19 are all the claims pending in the application. Claims 5 and 6 stand objected to only as being dependent upon a rejected base claim, and would be allowable if rewritten in independent form to include all the limitations of the base claim and any intervening claims. Claims 5 and 6 have been rewritten in independent form to place them in condition for immediate allowance.

Claims 1-4 and 7 stand rejected on prior art grounds. Applicants respectfully traverse this rejection based on the following discussion.

I. The Prior Art Rejections

Claims 1-4 and 7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Anthony et al. (5,300,313). Applicants respectfully traverse this rejection based on the following discussion.

Anthony discloses a process where the thickness of a layer of material deposited by chemical vapor deposition, such as a diamond layer, is monitored by providing the substrate on which the material is deposited with at least one perforation of a predetermined size. The relationship between the thickness of the layer formed in the perforation and the thickness of the layer formed on the substrate surface is determined, so that the thickness of the surface layer can be determined from the thickness of the layer formed in the perforation.

To the contrary, the claimed invention determines the actual film profile of a film formed in the integrated circuit manufacturing process by plotting multiple thickness measures across the film and then compares the actual film profile with a desired film profile (claim 1). Thus, the claimed invention improves the control of film thicknesses within semiconductor manufacturing processes by evaluating an entire profile of a film layer (as opposed to an individual point, or the average of many points, within the film layer). Therefore, the invention does more than just evaluate whether the average thickness of a film layer is within an acceptable range. To the contrary, the invention evaluates whether the entire "profile" (e.g., cross-section) of the film layer

is within an acceptable thickness profile range. By evaluating the profiles of the films, the invention more accurately evaluates the quality of the film layer in question, as well as the true variability of the film processing equipment and or film measurement equipment. This in turn allows the film formation processing to be refined more precisely, thereby reducing defects substantially and increasing yield.

Conventional process control schemes are not sensitive to the desired film thickness profile. To the contrary, conventional film thickness control methodologies merely measure one or more individual locations of the film. Because the film is not always flat, the conventional measurement process will contain inconsistencies that are simply based upon the natural profile of the film. Therefore, the conventional film thickness control process could indicate that two drastically different films have the same thicknesses and variability because mathematically the measurements produce the same statistical answer; however, the actual film thickness profiles are different. For example, convex and concave films could give the same average thickness and variability but physically are very different.

Anthony explains that the CVD operation is continued until the perforation is bridged. This is convenient when the size of the perforation is related to the desired thickness of the surface layer so that bridging occurs when said desired thickness has been reached. However, it is also contemplated to employ a larger perforation and to more closely monitor the thickness of the layer formed on the walls thereof which are at an angle to, and preferably perpendicular to, the surface.

Thus, with Anthony, the dimensions and particularly the width of the perforation are an important factor in the operation of the invention. For example, Anthony explains that as a first approximation, it might be assumed that the width of the perforation should be at least twice the desired thickness of the diamond layer, since the layer produced in said perforation will grow on both sides at once. In practice, however, diamond growth is somewhat slower in the perforation than elsewhere on the substrate surface by reason of the necessity to fill said perforation, at least partially, with diamond. Indeed, in Anthony it was determined that, as a general rule, the width (diameter in the case of a circular hole) of the hole should be at least about 150-160% of the

desired thickness of the diamond layer in order for the hole to be completely bridged or the diamond coating on the walls thereof measurable when the desired surface thickness is reached.

To the contrary the claimed invention is concerned with the film profile, not filling a perforation as in Anthony. Therefore, as shown above, the invention improves the control of film thicknesses within semiconductor manufacturing processes by evaluating an entire profile of a film layer (as opposed to an average of all points within the film layer). Therefore, the invention does more than just evaluate whether the average thickness of the film layer is within an acceptable range. To the contrary, the invention evaluates whether the entire "profile" (e.g., cross-section) of the film layer is within an acceptable thickness profile range. By evaluating the profiles of the films, the invention more accurately evaluates the real variability of the film layer in question. This in turn allows the film formation processing to be refined more precisely, thereby reducing process excursions substantially and increasing yield.

In the invention, semiconductor processing and control benefits ensure that target film thickness control is preserved. The invention can be applied to metrology tools or fabricator control systems. The invention shows deviation from expected profiles and allows for control of serial processes to optimize yields. The invention also allows for feed-forward profile control. The invention can be applied to other geometric profiles (line, trough, contact, and via profiles). The invention can be used in other environments with any geometric profile controls (beams, rods, tubes, sheets, tapes, wires, etc....).

Therefore, Applicants respectfully submit that Anthony does not teach or suggest "determining the actual film profile of a film formed in said integrated circuit manufacturing process by plotting multiple thickness measures across said film" and then "comparing said actual film profile with a desired film profile" as defined by independent claim 1. Therefore, it is Applicants position that independent claim 1 is patentable over Anthony. Further, dependent claims 2-4 and 7 are similarly patentable, not only because they depended from a patentable independent claim, but also because of the additional features of the invention they define. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdrawn this

rejection.

II. Formal Matters and Conclusion

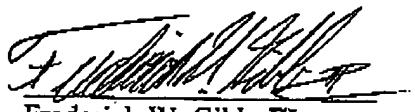
With respect to the objection to the Abstract, a substitute Abstract is provided above that is in narrative form and within the range of 50 to 150 words. In view of the foregoing, the Examiner is requested to withdrawn this objection.

Thus, Applicants submit that claims 1-19, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

Dated: 10/13/04



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